Teachers'
Retirement System
State of Montana
actuarial
evaluation as of
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TEACHERS' RETIREMENT SYSTEM

STATE OF MONTANA

ACTUARIAL VALUATION

as of

July 1, 1971

PLEASE RETURN

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INTRODUCTION

In accordance with Chapter 6[illegible], Section 75-6205 of the Teachers' Retirement Law, an actuarial valuation of The Teachers' Retirement System of the State of Montana has been completed. The purpose of this valuation was to determine the position of the fund, the normal cost, and the unfunded accrued liability based on present and prospective assets and liabilities of the System for the fiscal year beginning July 1, 1971.

The valuation was based on employee data and other records maintained by the System as of June 30, 1971, and incorporates all amendments of the Retirement Law as of July 1, 1971.

This report presents the results of the valuation.

ACTUARIAL CERTIFICATION

Based upon the assumptions stated herein and the data maintained by The Teachers' Retirement System, this actuarial valuation has been performed in accordance with accepted actuarial principles and techniques.

Alton P. Hendrickson

Associate of the
Society of Actuaries

METHOD OF FUNDING

The method of funding employed is commonly referred to as the "entry-age normal cost method." This method establishes a "normal cost" for each member as well as an unfunded accrued liability. The annual normal cost is the level percentage of annual salary required to fund the benefits assuming this percentage had been contributed since the member's entry into the System.

The unfunded accrued liability represents the liability for accrued benefits which has not been previously funded. This liability can arise from four sources:

(1) If the member began teaching prior to the establishment of the System (1937), and thus did not contribute during the prior years.

(2) If the member received additional credit which was not funded or only partially funded, such as military service and out-of-state teaching credit.

(3) If benefits were increased for which no funding had been previously made.

(4) If actuarial losses were incurred when actual experience varied from expected experience.

In order to maintain the System on an actuarially sound basis, the total rate of contribution should be such to meet the normal costs in addition to making some progress towards the amortization of the unfunded accrued liability.

of The Teachers' Retirement System during 1966-71 with an adjustment for an anticipated decrease in withdrawals in future years.

Rates of Withdrawal

Age	Female	Male
25	24.47%	20.58%
30	21.16	12.25
35	15.00	9.07
40	10.20	8.28
45	6.76	7.07
50	4.68	5.44
55	2.96	3.38
60	1.94	2.05

Salary Scale

The rates of increase are based upon a study of current salary formulas with a minimum annual increase of 3% assumed as a result of inflation.

Expected Final Salary
As a Multiple of Current Salary

Service at Retirement	Current Years of Service						
	0	5	10	15	20	25	30
5	1.26						
10	1.53	1.21					
15	1.79	1.42	1.17				
20	2.07	1.65	1.36	1.16			
25	2.40	1.91	1.57	1.34	1.16		
30	2.79	2.22	1.83	1.56	1.34	1.16	
35	3.23	2.57	2.12	1.81	1.56	1.34	1.16

Retirement Rates

The rates of retirement are based upon the actual experience of The Teachers' Retirement System during 1966-71.

Rates of Retirement

Age	Female	Male
60	12.0%	11.0%
61	13.0	11.0
62	13.0	11.0
63	13.0	12.0
64	13.0	13.0
65	13.0	14.0
66	10.0	11.0
67	6.0	8.0
68	4.0	5.0
69	2.0	3.0
70	1.0	1.0

Investment Earnings

An annual rate of 5% is assumed for future investment earnings.

Expenses

Administrative expenses are to be paid from membership fees and excess investment income.

Assets

The security investments are valued at amortized book value. The real estate mortgages are valued at full prinicpal value.

ANALYSIS OF VALUATION

The conclusion of the valuation is that The Teachers' Retirement System of the State of Montana is funded on an actuarially sound basis. The contribution of 10 1/8% (employer rate of 5 1/8%; employee rate of 5%) is sufficient to fund the normal costs and provide for amortization of the unfunded accrued liability over a period of 68.4 years.

There is no predetermined number of years over which the unfunded accrued liability must be funded; however, it is recommended that an amortization period of 40 years be considered. If this period of amortization is desired, the contribution rate required is 10.938% or an increase of .813%.

SCHEDULE 1

NORMAL COST ALLOCATION

	Contribution Rate		
	Female	Male	Total
Retirement	5.341%	4.512%	5.165%
Death	.277	.506	.401
Disability	.225	.234	.230
Vested	.684	.890	.796
Return of Contribution	1.151	.658	.883
Total	8.278%	6.800%	7.475%

(1)	Present Value of Future Salaries of Present Members	$735,636,225.00
(2)	Normal Cost Contribution Rate	7.475%
(3)	Present Value of Future Normal Costs for Present Members [(1) x (2.]	$ 54,988,808.00

SCHEDULE 2

Unfunded Accrued Liability Allocation

(1)	Present Value of Benefits (Schedule 3	$ 215,2[illegible]
(2)	Present Value of Future Normal Costs (Schedule 1)	54,988,808.00
(3)	Trust Fund Assets (Schedule 4)	66,253,000.00
(4)	Unfunded Accrued Liability [(1)-(2)-(3)]	93,968,997.00

Amortization over 40-year Period

(5)	Present Value of Salaries of Members During Next 40 Years	$ 2,713,706,810.00
(6)	Unfunded Accrued Liability Contribution Rate [(4) ÷ (5)]	3.463%
(7)	Normal Cost Contribution Rate (Schedule 1)	7.475
(8)	Recommended Contribution Rate	10.938%
(9)	Current Contribution Rate	10.125
(10)	Recommended Contribution Increase [(8) - (9)]	.813%

Current Period of Amortization (68.4 Years)

(11)	Present Value of Salaries of Members During Next 68.4 Years	$3,545,950,752.00
(12)	Unfunded Accrued Liability Contribution Rate [(4) ÷ (11)]	2.650%
(13)	Current Contribution Rate [(7) + (12)]	10.125%

SCHEDULE 1

ACTUARIAL BALANCE SHEET

Assets:

1.	Trust Fund	$60,253,090.00	
2.	Present Value of Future Contributions for Unfunded Accrued Liability	93,968,997.00	
3.	Present Value of Future Contributions for Normal Costs	54,988,808.00	
Total Assets			$215,210,895.00

Liabilities:

1.	Present Value of Benefits - Inactive Members		
	(a) Retirement	$37,780,579.00	
	(b) Death	2,240,386.00	
	(c) Disability	1,110,785.00	
	(d) Vested	3,953,805.00	
	(e) Dormant	166,422.00	
	(f) Excess Interest Payment	1,753,860.00	
			$ 47,005,837.00
2.	Present Value of Benefits - Active Members		
	(a) Retirement	$121,981,821.00	
	(b) Death	10,297,889.00	
	(c) Disability	4,767,765.00	
	(d) Vested	20,995,244.00	
	(e) Return of Contributions	9,247,288.00	
	(f) Legacy Fund	26,355.00	
	(g) Supplemental Benefits (Tax-deferred Annuities)	888,396.00	
			$168,205,358.00
Total Liabilities			$215,210,895.00

SCHEDULE 4

SUMMARY OF FUND OPERATION

Trust Fund as of July 1, 1970		$ 57,074,887.00
Receipts:		
Employer Contributions	$ 4,950,957.00	
Employee Contributions	5,918,067.00	
Investment Income	3,798,058.00	
Realized Capital Loss	(253,275.00)	
Transfer from Agency Fund	98,343.00	
		$ 14,512,150.00
Disbursements:		
Benefit Payments	$ 4,683,401.00	
Withdrawal Refunds	1,042,411.00	
Operational Expenses	109,792.00	
Transfer to Earmarked Revenue Fund	98,343.00	
		$ 5,933,947.00
Trust Fund as of June 30, 1971		$ 66,253,090.00

SCHEDULE 5

COMPARISON SUMMARY

	Fiscal Year Ended 1970	Fiscal Year Ended 1971
Trust Fund Assets	$ 57,674,887.00	$ 66,253,090.00
Present Value of Normal Costs	N/A	$ 54,988,808.00
Unfunded Accrued Liabilities	N/A	$ 93,968,997.00
Total Liabilities	N/A	$215,210,895.00
Total Contributions Received	$ 9,658,740.00	$ 10,869,024.00
Active Members:		
Covered Annual Payroll	$ 98,405,995.00	$106,783,231.00
Est. Monthly Retirement Benefits	6,890,259.00	$ 8,128,929.00
Membership Prior Year	11,126	11,454
Non-vested Terminations	1,660	1,428
Vested Terminations	68	87
Retirements	164	166
Deaths	11	12
Disabilities	5	11
New Members	2,236	2,136
Membership Current Year	11,454	11,886
Inactive Members:		
Monthly Benefits Payable	$ 399,058.00	$ 434,632.00
Membership prior Year	2,356	2,554
Deaths	50	80
New Entrants	248	276
Membership Current Year	2,554	2,750

SCHEDULE 6

SUMMARY OF ACTIVE MEMBERS

FEMALES

Nearest Age	Members	Average Current Service	Average Final Service	Average Current Salary	Final Average Salary	Average Retirement Benefit
-29	1,959	2.06	36.71	$ 6,713	$ 21,084	$ 922.22
30-34	617	4.14	33.73	7,784	19,777	797.17
35-39	491	5.33	30.16	7,874	17,064	620.87
40-44	527	6.36	26.27	8,052	14,916	472.77
45-49	498	8.36	23.23	8,259	12,987	365.74
50-54	680	11.64	21.47	8,508	11,372	298.82
55-59	679	15.69	20.53	8,653	9,858	250.59
60-64	605	18.63	20.69	8,855	8,968	231.62
65-	220	19.98	20.74	7,819	7,828	202.85
Total	6,276					

MALES

Nearest Age	Members	Average Current Service	Average Final Service	Average Current Salary	Final Average Salary	Average Retirement Benefit
-29	1,413	2.27	36.15	$ 7,445	$ 22,635	$ 973.78
30-34	1,115	4.43	33.93	9,449	23,935	965.00
35-39	897	6.70	31.33	10,930	23,326	869.69
40-44	645	9.70	29.53	11,744	21,390	753.33
45-49	576	13.21	27.88	12,490	19,379	645.63
50-54	365	16.27	26.19	12,928	17,276	547.00
55-59	268	19.23	24.14	12,722	14,559	432.28
60-64	188	23.45	25.82	13,260	13,403	432.05
65-	143	25.02	25.76	11,918	11,910	385.02
Total	5,610					

SCHEDULE I

SUMMARY OF RETIREMENT BENEFITS

Nearest Age	FEMALE Annuitants	FEMALE Monthly Benefit	MALE Annuitants	MALE Monthly Benefit
-64	266	$ 37,804.06	61	$ 10,830.14
65-69	527	94,129.39	102	24,115.64
70-74	461	80,259.73	74	15,370.43
75-79	290	38,299.26	42	7,658.08
80-84	181	29,314.05	40	7,008.45
85-89	70	11,361.22	16	3,228.22
90-94	19	2,954.38	5	657.36
95-	5	780.85	2	275.25
Total	1,819	$294,902.94	342	$ 69,143.57
Average		$ 162.12		$ 202.17

SCHEDULE 8

SUMMARY OF DEATH BENEFITS

Nearest Age	FEMALE Beneficiaries	FEMALE Monthly Benefit	MALE Beneficiaries	MALE Monthly Benefit
-29	3	$ 72.56	4	$ 118.10
30-34	3	80.48	1	30.95
35-39	5	612.91	3	249.73
40-44	2	339.58	6	432.69
45-49	9	943.44	3	257.96
50-54	15	1,356.49	3	896.99
55-59	22	2,905.12	7	1,001.89
60-64	15	2,262.77	10	1,383.03
65-69	18	2,201.80	8	924.23
70-74	14	1,846.23	5	462.73
75-	10	1,455.28	8	1,079.29
Total	116	$14,076.66	58	$6,897.57
Average		$ 121.35		$ 118.93

SCHEDULE 9

SUMMARY OF DISABILITY BENEFITS

Nearest Age	FEMALE Annuitants	FEMALE Monthly Benefit	MALE Annuitants	MALE Monthly Benefit
-29	0	---	0	---
30-34	0	---	0	---
35-39	1	$ 86.28	1	$ 115.63
40-44	1	144.10	0	---
45-49	3	379.17	1	187.91
50-54	12	2,033.35	2	313.20
55-59	15	2,528.36	5	1,205.13
60-64	17	3,105.76	1	209.74
65-69	1	90.48	0	---
70-74	0	---	0	---
75-	0	---	0	---
Total	50	$8,367.50	10	$2,031.61
Average		$167.35		$203.16

SCHEDULE 1

SUMMARY OF VESTED BENEFITS

Nearest Age	FEMALE Members	FEMALE Monthly Benefit	MALE Members	MALE Monthly Benefit
-29	1	$ 53.07	0	---
30-34	9	508.20	7	$ 394.10
35-39	8	575.95	4	264.34
40-44	15	1,067.81	24	1,799.12
45-49	19	1,746.86	38	3,439.38
50-5-	49	6,153.43	45	5,947.31
55-59	63	8,154.99	45	5,622.71
60-64	16	1,302.09	5	596.26
65-69	4	492.13	1	126.58
70-74	2	367.80	0	---
75-	0	---	0	---
Total	186	$21,022.33	169	$18,189.80
Average		$113.02		$107.63

Summary of Benefit Provisions

Vesting Period -	5 years. No benefits are payable unless the member has a vested right.
Final Average Salary -	Average of 3 highest consecutive years of earnings.
Normal Form of Benefits -	Life only annuity. All benefits cease upon death.
Retirement Benefits -	Minimum age 60 Maximum age 70 Maximum service 35 years; however, credit is given for all service rendered prior to age 60. The retirement benefit is equal to one-seventieth (1/70) of final average salary for each year of service. The minimum benefit is equal to one-seventieth (1/70) of $4,000 for each year of service.
Death Benefits -	The death benefit is equal to one-seventieth (1/70) of final average salary for each year of service accrued at date of death with an actuarial adjustment based on the relation of the member's age at death to his beneficiary's age. In addition a child's benefit of $50/month is paid to each child under age 18 until he attains age 18.
Disability Benefits -	The disability benefit is equal to one-seventieth (1/70) of final average salary for each year of service accrued at date of disability. The minimum disability benefit is equal to one-quarter (¼) of the final average salary.
Withdrawal Benefits -	With less than 5 years of service, the accumulated employee contributions are returned. With more than 5 years, the member may elect a refund of contributions or leave his contributions and retain a vested right to death and retirement benefits.

Tax-Deferred Annuities :

The Teachers' Retirement System sponsors a tax-deferred annuity program for the benefit of its members. The policies of this program have been

established in accordance with guidelines set by the Internal Revenue Service. The benefits provided by this program are determined solely by the value of the member's account (voluntary contributions plus interest) using actuarial tables approved by the Retirement Board.

COMMENTS and RECOMMENDATIONS

1) Contribution Rate

As stated in the analysis of the valuation, the recommended period of amortization for the unfunded accrued liability is 40 years. This period is based upon the thought that the contribution rate for a new member should be such that at his retirement no unfunded liability will remain.

While it may not be desirable or feasible at this time to increase the contribution rate as recommended, the recommended amortization period should be given consideration when funding for any future increased benefits.

2) Maintaining the System on an Actuarially Sound Basis

As previously stated, the System is funded on an actuarially sound basis. Actuarial soundness may be defined as:

> If in determining the costs of the System, a recognized funding method is employed, if a specific contribution schedule is followed (so as to amortize the unfunded accrued liability over a limited period), and if the actuarial assumptions are tested regularly for appropriateness, with changes being made from time to time as experience warrants, the System may be referred to as actuarially sound.

As can be seen from this definition, it is important that periodic valuations be conducted in the future to insure actuarial soundness. Preferably a valuation should be conducted annually.

3) Funding Method

The funding method employed is the "entry-age normal cost method." This method's advantage is that all actuarial gains and losses are reflected immediately in the unfunded accrued liability, thereby maintaining a constant normal cost for each member.

The reasons for a funding method are:

(a) To increase the security of the benefits by accumulating assets in an orderly manner.

(b) To provide for the equitable treatment of different generations of members by assigning reasonable costs to each year.

(c) To allow some flexibility for benefit and contribution changes, by varying the period of amortization of the unfunded accrued liability.

(4) Actuarial Assumptions

All actuarial assumptions except for mortality and disability rates are based upon the actual experience of the System.

The mortality rates are based upon the 1965 Group Annuity Table for males and females which is commonly accepted as a basis for valuing retirement plans.

The disability rates are based upon the experience of members covered by the Railroad Retirement Act. Because of the large number of lives exposed, this experience is commonly used. The rates illustrated in the assumptions were published in the eighth valuation of the Railroad Retirement Board and are based upon ordinary disability, not industrial.

It is not recommended that the mortality and disability rates be based upon actual experience since the small size of the System would allow too much likelihood of chance fluctuations.

The withdrawal rates are based upon actual experience with an adjusted reduction for expected decreases in the future. The heaviest reduction was made for younger lives and a decreasing reduction at older ages. The average withdrawal rate for all ages has been 13.0%. The rates illustrated in the assumptions produce an average withdrawal rate of 11.7% for an overall reduction of 10%.

(5) Computer Facilities

An actuarial valuation requires specific data on each member of the System. Because of the size of the group (15,000 members and the importance of the accuracy of the valuation, it is imperative that the necessary data be readily available. This is not the situation with the current accounting procedures of the System.

Because the System's computer facilities were not large enough to handle the size of the computer program required in the valuation, it was handled by the State's IBM 360 computer. Since this computer would not accept data on the magnetic striped ledgers maintained by the System, the data had to be punched on IBM cards. This transfer of data required five pieces of processing equipment; the down-time was considerable. Over one month was devoted to the compiling of the data used in the valuation. This is not feasible if the valuation is to be conducted annually.

It is recommended that consideration be given to maintaining the data on active and inactive members in a form that allows for ready access, such as magnetic tape. This would simplify compiling the data for valuation purposes as well as allow for better statistical information.

(c) Interest Credit and Charges

(a) Upon termination, a non-vested member may only receive his personal contributions as a refund: the accrued interest is not refunded. This provision is not current with many of the other teacher retirement systems. Many have some provision for the refund of the accrued interest.

(b) A previous member re-entering the System may redeposit any withdrawals in order to receive credit for previous service provided he makes payment for the interest which has accrued since July 1, 1971. The current interest charge is 5½% per annum; this rate is set by the Board each year in direct relation to actual earnings.

Inasmuch as the present law requires a member to withdraw his contributions upon termination and since he probably cannot invest this money and enjoy a rate of return equal to the System's investment program, it does appear that the interest charge may become excessive and restrict the member's ability to make the redeposit upon his return to teaching.

(c) It is therefore recommended that consideration be given to setting the interest rate at 4½% and that the accrued interest be refunded to members upon termination. It is not recommended that the actual rate of interest be refunded. The excess interest is needed to:

(i) provide for administrative expenses incurred

(ii) provide for liabilities of death and disability benefits carried on vested members prior to their withdrawal

(iii) provide for investment losses incurred as a result of the required liquidation of assets

The rate of 4½% would be a reasonable fixed rate to be charged on redeposits of withdrawals. This rate would also apply to other payments such as the purchase of out-of-state teaching credit.

(d) The tax-deferred annuity accounts are credited with interest in direct relation to the actual earnings. This policy should continue for those accounts used to supplement the retirement benefits. However, if the member elects to withdraw his account prior to retirement, it is recommended that the rate of 4½% be used to determine his cash value. Since there is no service charge, the excess interest is required to offset the administrative expenses incurred by members who inadvisably use this account as a temporary savings account.

(e) If the refund of interest at 4% were implemented, the period of amortization at the present contribution rate would be increased 9/10 years. If the cost were to be amortized over a 40-year period, an additional .016% contribution rate would be required.

The cost of reducing the interest rate on redeposits would depend upon the number of members re-entering the System who take advantage of the redeposit provision. In any event, the cost would be nominal.

There would of course be no cost to the System in regard to the tax-deferred annuity program. The program would simply better provide for its own expenses.

(7) Normal Form of Benefits

The normal form of benefits is a life only annuity with all benefits ceasing upon death unless death occurs within three months after retirement; then, the member's account balance less benefits received is refunded to his beneficiary.

It is recommended that this form of benefit continue with the deletion of the arbitrary 3-month period and the added provision that in no event will a member receive less than his personal contributions plus interest. In the event of his death prior to receiving this amount, the balance would be paid to his beneficiary.

If this change is implemented, the period of amortization at the present contribution rate would be increased 8/10 years. If the cost were to be amortized over a 40-year period, an additional .016% contribution rate would be required.

(8) Excess Interest Payment

Since 1967 a 13th check in the form of excess interest has been paid to all annuitants each year. This adjustment has been necessary in order to maintain equity because prior to July 1, 1971 a portion of the retirement benefit was based on the member's personal contributions. In determining the benefit, a conservative rate of 3% was used, thereby understating the monthly income. The 13th check has been used to adjust for this understatement based on current earnings.

Since July 1, 1971 retirement benefits have been based on a fixed benefit formula. The rate of assumed interest no longer affects the benefits, and therefore the 13th check is no longer needed to maintain equity for members retiring after July 1, 1971. This is particularly true since the new formula produces substantially larger benefits (approximately 25%).

For purposes of this valuation, it is assumed that the 13th check will be paid in the future only to members retired prior to July 1, 1971.

If it were desired to continue paying a 13th check to all future retirees at the present rate, the additional contribution required to fund the normal cost and amortize the unfunded portion over 40 years would be .490%.

(9) Membership Fees

The recent auditor's report recommends that the $1.00 membership fee be discontinued since the time and expense involved to all parties concerned may well offset the amount collected. This may be the case, but in any event, for the purposes of the valuation the expenses are assumed to be paid from excess investment earnings and as a result the additional costs incurred are negligible.

(10) Early Retirement

The retirement plan has no provision for early retirement. It is recommended that a provision be made that would allow a member to retire as early as age 55. The benefit would be the actuarial equivalent of the benefit provided under the current formula which the member would otherwise have received at age 60. The following table illustrates the actuarial reduction at the early retirement ages:

Retirement Age	Per cent of Benefit
59	92.53%
58	85.79
57	79.69
56	74.15
55	69.11

The above rates are based on the current actuarial table. The reduction adjusts for the increased period over which the benefits are expected to be paid in addition to the loss of interest incurred. If these rates are employed, there will be no additional cost to the System.

(11) Funding of Previous Benefits

Prior to July 1, 1971 the benefits had been based on a fixed formula in addition to the amount purchased by the member's personal contributions. The total rate of contribution received was 9.5%.

To provide for the increased benefits after July 1, 1971, an additional 5/8% contribution was requested for a total of 10.125%.

A valuation of the previous benefits has determined that the 4.5% contribution rate was sufficient to fund the normal cost in addition to amortizing the unfunded accrued liability over 56 years.

If the previous rate of funding were desired, the increased contribution rate requested should have been 7/8% as opposed to the 5/8% which was requested.

(12) Summary

It is recommended that steps be taken to implement items 6, 7, 9 and 10 as soon as possible. It is not felt that the costs incurred are sufficient to request additional appropriations from the Legislature at this time. However, it is recommended that any future legislative proposals providing for substantially improved benefits include provisions for increased contribution rates which would amortize the additional cost over a 40-year period.

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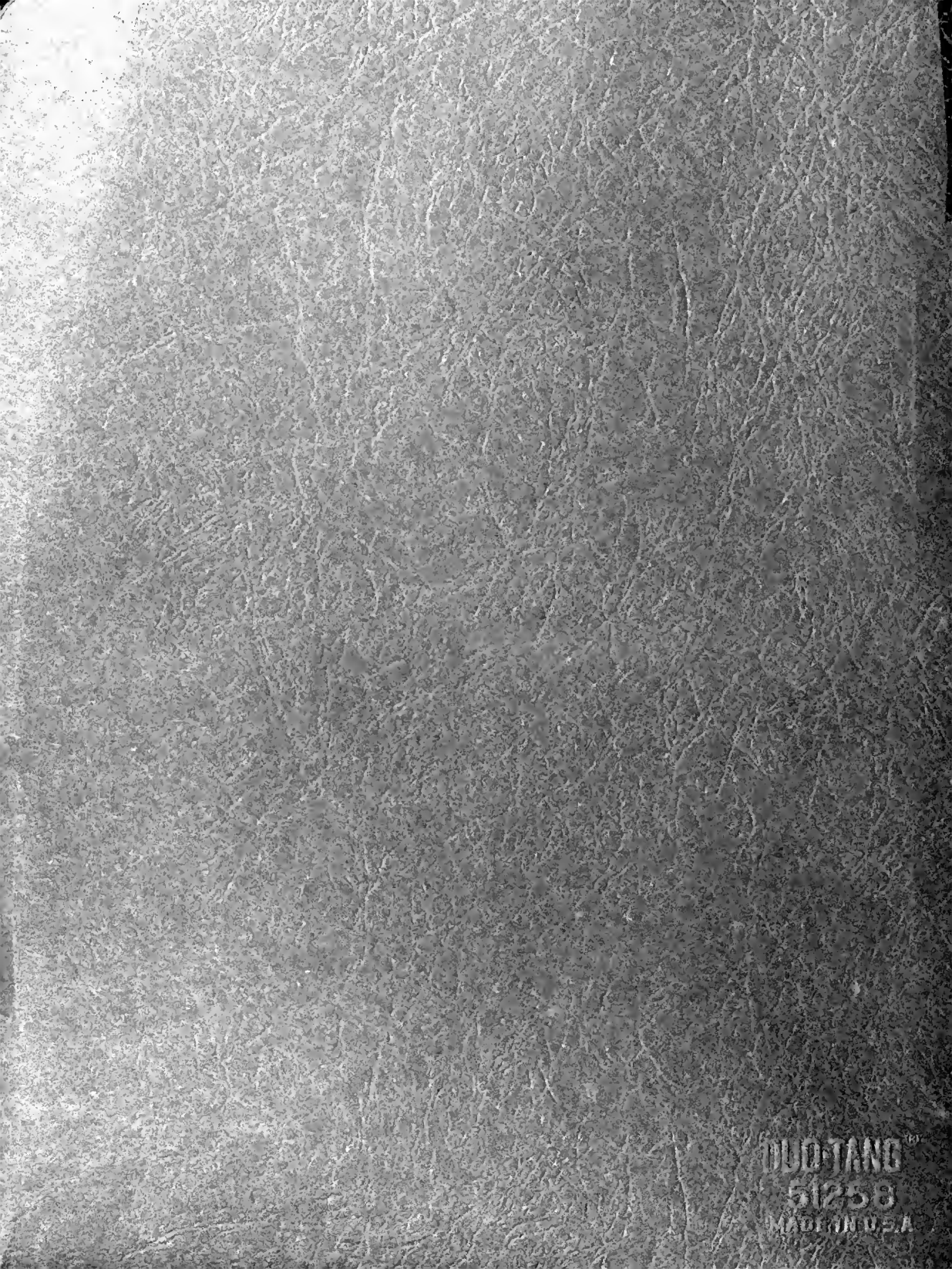
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